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Response to 'About the diffuse absences and the diffuse planes due to the atomic size effect'

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We were indeed unaware of the excellent contribution by Glas, Gors & Hénoc (1990) on size-effect disorder in III–V semiconductor compounds and their related conference proceeding publications. The diffuse scattering that they observed and describe does arise from size-effect distortions but, because there exists a large scattering contrast between the constituent atomic species in these compounds, the scattering effect that they observed is best interpreted in terms of the well known Warren size-effect scattering (Warren, Averbach & Roberts, 1951). This results in a transfer of the Laue monotonic intensity across certain reciprocal planes and, depending on the range of the correlation of atomic pair lengths, can give rise to a relatively sharp diffuse line offset from but parallel to rows of Bragg diffraction spots. Simulations of this effect were carried out by one of us (Welberry, 1986) to demonstrate just this point. Diffuse scattering patterns nearly identical to those presented by Glas, Gors & Hénoc (1990) were produced. In particular, the scattering distribution in Fig. 1(*c*) of Welberry (1986) can be compared with Fig. 7 of Glas, Gors & Hénoc (1990).

The diffuse absences and diffuse planes that we describe in our recent paper (Butler, Withers & Welberry, 1992) persist – and indeed become the prominent feature – when the scattering contrast decreases and the Laue monotonic intensity vanishes. This effect results not from correlation betwen the *lengths* of interatomic vectors but from correlations between the *direction of motion* of atom pairs. An intensity distribution that is symmetric about reciprocal planes connecting Bragg spots is the result. When size-effect-like distortions are present, we found that the near-neighbour atom pairs tend to have a positive displacement correlation and further neighbours a negative displacement correlation. This creates an absence of diffuse intensity along rows connecting Bragg peaks. We believe this interpretation of the apparent diffuse absences in the two material examples of our paper (where scattering contrast was minimal) is the most informative.

Admittedly, Glas *et al.* (1990) have computed the diffuse intensity exactly from their model so aspects of both the Warren terms and this symmetric component must be present. However, as we pointed out in our paper, when the scattering contrast is large, the asymmetric Warren size-effect intensity dominates and when the scattring contrast diminishes, the diffuse intensity is composed mainly of symmetric components associated with mean-squared pair displacements.

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